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Natural Sciences and Engineering Research Council of Canada

NSERC Contact

Investing in people, discovery and innovation

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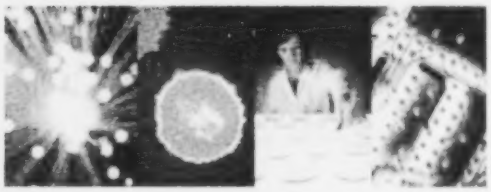

NSERC's Budget Climbs Again

Editorial by Tom Brzustowski

Once again there was good news in the federal budget for Canadian university researchers in the natural sciences and engineering. In 1999-2000, NSERC's budget will be $538.5 million. That's $103 million more than in 1997-98.

This is the third consecutive budget in which new resources were provided for university research:

- The 1997 budget made the Networks of Centres of Excellence (NCE) program permanent and created the Canada Foundation for Innovation (CFI).
- The 1998 budget restored all the budget cuts of the granting councils.
- And this year, the annual budget of NSERC was increased by a further $25 million. In addition, we received $7.5 million per year to help those of our community engaged in health research broadly defined. (This is an interim step on the way to the full implementation of the Canadian Institutes for Health Research that is expected to provide significantly increased funding for all areas of health research.)

Beyond these direct additions to NSERC's budget, the allocations for the NCEs went up by $30 million, or 63 per cent. And, finally, the CFI received an additional $200 million of endowment.

These increases are very helpful. They will make it possible for NSERC to take a second step in dealing with the budget pressures that I have been describing in *Contact* and in my presentations to the Standing Committee on Finance. The increase for the NCE program will make it possible to have more frequent competitions and create as many as eight additional networks. And the new money for the CFI will enable it to meet a larger proportion of the huge demand for new research infrastructure.

NSERC's motto is "Investing in People, Discovery and Innovation." We were able to invest more in all three last year, and the new budget means we will be able to invest more in all three again this year.

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NSERC is Canada's instrument for promoting and supporting university research in the natural sciences and engineering, other than the health sciences.

NSERC supports both basic university research through research grants and project research through partnerships of universities with industry as well as the advanced training of highly qualified people in both areas.

"Eggsact"ly

Rod MacIvor, The Ottawa Citizen

Professor Mary Anne White of Dalhousie University holds a 53.99-kg egg timer that changes colour when an egg is cooked. Speaking to MPs at a recent breakfast at the House of Commons, the NSERC grantee predicted an exciting future for chemistry and for new products based on smart materials. The monthly Bacon and Eggheads lecture series is co-sponsored by NSERC and the Partnership Group for Science and Engineering.

Continued from cover page

Canada's research excellence recognized

The last three budgets have made it clear that the Government of Canada is committed to providing more adequate support for university research and recognizes the strategic importance of research for the prosperity and well-being of Canadians. I am thrilled, therefore, to be able to demonstrate that the quality of that research is very high. I refer to the article, "Benchmarking International Research" by Jonathan Adams, published in *Nature* (Dec. 17, 1998, pp. 615-618). This bibliometric study shows that Canadian research ranks third overall behind the U.S. and the U.K., with first-place ranking in three disciplines and second-place ranking in fifteen others, out of a total of forty-seven.

Since the Adams study is based on the citations of research publications, I believe that it attests mainly to the excellence of *basic* research in Canadian universities.

Innovation and productivity

I also found the last budget encouraging in one additional way that has to do with two particular words rather than numbers. There were many references in the budget to "innovation" and "productivity." Innovation, we all agree, is something very positive. It's the process of bringing new goods and services to market, and science-based innovation—the kind with which many NSERC grantees are familiar—generally starts with a discovery or an invention in the lab.

We sell two kinds of products to the world: innovations and commodities. But it is only the innovations that allow us to set the prices with high margins that provide the payback for R&D and allow us to invest in the next generation of innovations. In selling commodities, we must take whatever prices the world markets offer, and we are painfully aware how low those prices have fallen recently and what problems that has caused for the producers.

In contrast to innovation, productivity seems to project a negative image to the public. Many economists and business leaders point out that Canada's standard of living has been slipping because our productivity growth hasn't been keeping up with that of our trading partners, and that we must reverse that trend. To ordinary Canadians, however, productivity increases have often meant plant closings and layoffs, having to do more of the same work for less pay, and the replacement of workers by technology.

Adding value

But productivity increases need not be negative for anyone. Productivity is simply the value of what is produced divided by the cost of producing it. If people have a negative view of productivity increases, it is because they've too often seen it done by "downsizing" the denominator of that fraction. However, much of the research that NSERC supports eventually increases the numerator of the same fraction by stimulating new economic activity that adds value to what Canada produces. That happens both through innovations that have their roots in research discoveries and inventions, and through the training of people who can use new knowledge productively.

NSERC is helping to increase Canada's productivity by increasing the value of what the country produces. We're not downsizing the denominator; we're growing the numerator—and that's good for everyone.

Progress on IP Policies

Universities, NSERC move IP management ahead

The management of intellectual property and its effective exploitation has become an increasingly complex and challenging business for our universities. With the growth in multi-university and multi-industry partnerships and collaborations, the question of harmonization of intellectual property (IP) management policies has become a major item on university, government and corporate agendas, says Janet Walden, NSERC's Director General of Research Partnerships. She cites several recent initiatives:

- In November 1998, the Association of Universities and Colleges of Canada (AUCC) held a symposium on IP issues. (The AUCC Web site (www.aucc.ca/english/new) contains some of the perspectives presented.)
- The March meeting of the Association of University Technology Managers (AUTM), held in San Diego, included a special Canadian meeting that focused on a number of common IP management issues. The question of the ownership of IP developed at Canadian universities was a topic of debate without clear resolution.
- In April 1999, the Expert Panel on the Commercialization of University Research, which has been examining the issues surrounding the management and commercialization of university-generated IP, expects to consult on its working paper. No doubt they will be seeking input on the issue of developing common IP policies and guidelines for best practices. The Panel was set up by the federal Advisory Committee on Science and Technology.
- In June 1999, look for a meeting organized by the AUCC for Vice Presidents of Research. The focus on local and national innovation systems and best practices, and the outcomes of the report from the Expert Panel on the Commercialization of University Research, will likely advance the debate on how to evolve the university knowledge and technology-transfer functions to meet the pressures for increased commercialization.

The drivers: complex relationships, maximized returns

The impetus for some harmonization of IP policies, says Walden, comes from a number of fronts: the increasing complexity in negotiating IP deals among researchers from institutions with different policies; industries that work with a number of universities and find it difficult to understand and work with these differences; the need to increase the flow out of universities of transferable innovations; and the drive to maximize technology transfer investment returns to Canada. These factors tend to push our thinking toward greater policy consistency, especially when the availability of trained professionals and financial resources is so limited. Where the creator owns the IP, the question of incentive to maximize returns to Canada also becomes an issue, along with an increased potential for conflict of interest. Opinions vary considerably regarding the ownership of IP and the degree of harmonization of IP policies necessary to effectively exploit university-generated ideas. It is generally accepted, however, that we need clear policies and agreements to accelerate the exploitation of our IP.

NSERC's programs adjusted accordingly

The universities are not alone in having to adjust. NSERC's programming has necessarily evolved to support the changing government and university roles. "We recognize that our mission includes fostering both the discovery and the application of knowledge," says Walden. "That's why we promote both the building of interactions among the university, government and industrial sectors, and the transfer of knowledge from those who generate it to those who can exploit it."

IP Management Today

- 60 per cent of Canadian universities actively manage (identify, protect, promote and/or commercialize) their IP, but resources are very limited.
- Approximately 50 per cent of Canadian universities own the IP developed by their faculty. The other half are either creator-owned or jointly owned in some proportion.
- The distribution of net revenues arising from assignment of IP to the university varies across universities and with respect to patents, know-how and copyright.

While NSERC's partnership programs have continued to consume around 25 per cent of its budget, the reach of these programs has increased. For example, the Collaborative Research and Development grants provide universities with $1.70 in contributions from the industrial sponsors for every $1.00 from NSERC. The launch of new and flexible initiatives, such as the Technology Partnerships Program (TPP), extends the reach of NSERC programming closer to market-readiness. TPP allows researchers to demonstrate the technical or economic feasibility of a technology to small- and medium-sized enterprises and/or to advance the work so that it is ready for transfer.

But there is more to this equation than ready-for-transfer research. NSERC has also pushed its programs to support its clients' needs for resources to effectively manage the IP being developed in the universities.

NSERC's Intellectual Property Management (IPM) Program

NSERC's proactive approach to encouraging the development of IP management resources in the universities began three years ago, when it established the Intellectual Property Management Program.

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The program challenged universities to increase their investment in IP management in partnership with NSERC. Industry liaison offices could turn to IPM for assistance with people and resources to identify, develop and protect IP, and to locate Canadian industry to exploit it. Because of the program, a number of universities have begun to collaborate on commercialization, which has been especially helpful to smaller universities.

Issues' complexity increasing

But the business of commercializing university technology is becoming increasingly complex, says Walden. Challenges that the universities' industry-liaison officers handle almost daily revolve around such issues as how to value IP; the impact of background technologies; the best means of protecting IP; decisions on whether to license or create a spinoff; and how to negotiate win-win research agreements.

"This very small contingent of people is an important resource for university researchers interested in protecting or commercializing their research results," Walden points out. "It's a resource that needs to grow both in numbers and in funding in order to maximize the return on investment in Canadian university research."

In June 1998, in recognition of the important contribution that these officers are making, NSERC's Council approved the continuation of the IPM initiative with an annual budget of $3 million. The second competition is under way, with results expected before the end of March 1999.

IPM results to date

- Even as a pilot program at $5.4 million over three years, the IPM program has contributed to significant improvements in the ability of Canadian universities to protect and commercialize the results of NSERC-funded research.
- The 1998 Statistics Canada Survey indicates that Canadian universities filed 320 patent applications last year and executed 195 new licenses. This is an upward trend, according to the AUTM Licensing Survey.

Statistics Canada also confirms what many already knew:

- The spinoff rate of company creation by Canadian universities is accelerating, with a total of 312 to date.
- Canadian universities hold equity in 13 per cent of these, for a total of $17 million in spinoff equity.
- At the University of British Columbia, 50 per cent of all contract research funds comes from "spinoff" companies.

A Giant of Canadian Science

Illustration courtesy of the National Research Council Canada

Dr. Gerhard Herzberg passed away March 3 at the age of 94. The excellence and importance of Dr. Herzberg's discoveries earned him worldwide respect, and the Nobel Prize in Chemistry in 1971. His research and his writing influenced several generations of scholars in many fields.

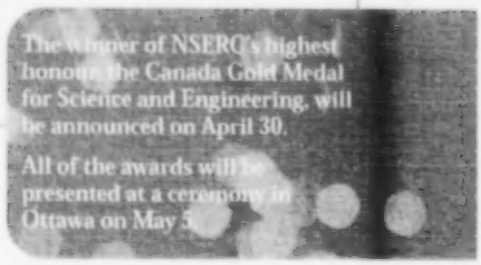
"I used his book on the spectra of diatomic molecules—the standard work on the subject—in my research on the combustion of metals as a graduate student in the United States," said NSERC President, Tom Brzustowski. "I have the book still, and marvel at the achievement that it represents." Canadian science as a whole has been made stronger because Gerhard Herzberg chose to spend most of his working life here. His dedication to scientific research and his enormous achievements in it have set a splendid and permanent example for Canadian scientists.

1999 NSERC Prize Winners Announced

The NSERC E.W.R. Steacie Memorial Fellowships and Doctoral Prizes are two of Canada's most important research prizes.

The prestigious Steacie Fellowships are named after Dr. Edgar William Richard Steacie, a physical chemist who, as President of the National Research Council from 1952 to 1962, did much to encourage young researchers. Open to both women and men, the fellowships are awarded to enhance the career development of outstanding and highly promising scientists and engineers who are staff members of Canadian universities. Successful fellows are relieved of any teaching and administrative duties for two years.

The NSERC Doctoral Prizes are awarded in recognition of high-quality research conducted by students completing their doctoral degrees. Two awards are available in the natural sciences and two in engineering.



The winner of NSERC's highest honour, the Canada Gold Medal for Science and Engineering, will be announced on April 30.

All of the awards will be presented at a ceremony in Ottawa on May 5.

Eight Canadians have been named winners of the 1999 NSERC Steacie Fellowships and Doctoral Prizes. The announcement was made in early February by the Hon. Ron Duhamel, Secretary of State (Science, Research and Development), and Tom Brzustowski, President of NSERC.

1999 NSERC Steacie Fellows

Dr. Mark Freeman
University of Alberta
Ultrafast laser technology

Dr. Mark Freeman has made fundamental and important contributions to condensed matter physics. Most recently, he made an already remarkable scientific tool—the scanning and tunnelling microscope—immensely more powerful by incorporating ultrafast laser flash technology that allows it to observe the minutest changes and details in material surfaces. The result is a revolutionary new class of instrument that may soon allow scientists to watch the behaviour of nanostructures, instant by instant, and atom by atom.

One of his devices enables researchers to observe, within a few picoseconds, the magnetic field reversals that take place on the surface of a magnetic head as it reads and writes data on a computer hard drive. This achievement is important to all companies researching new materials to record high-density magnetic data.

In 1998, Dr. Freeman was the inaugural winner of the University of Alberta's Martha Cook Piper Research Prize for outstanding accomplishment and demonstrated promise as a researcher.

Dr. Douglas Bonn
University of British Columbia
Testing superconductor theory

Dr. Douglas Bonn has had a major impact internationally in the quest to understand high-temperature superconductivity. His successes in studying how the electrons in superconducting metals and crystals respond to microwave and infrared radiation have earned him recognition as one of the top superconductor experimentalists in the world.

In 1993, with colleague Dr. Walter Hardy, Dr. Bonn was the first to report accurate measurements of the depth that microwaves penetrate into a superconducting crystal. These measurements altered the then-prevalent view on the nature of high-temperature superconductivity.

In 1997, the Canadian Association of Physicists awarded him the Herzberg Medal for outstanding achievement by a physicist under 40 years of age. He is an Associate in the Superconductivity Program of the Canadian Institute for Advanced Research.

Dr. Barbara Sherwood Lollar
University of Toronto
Stable isotope research

Dr. Barbara Sherwood Lollar is an international authority on how gases and fluids form and move within the earth, and on how both natural and man-made chemicals can be identified and tracked in ground water. Founder and Director of the University of Toronto's Stable Isotope Laboratory, she has pioneered a new approach to stable isotope research that involves looking at the isotopic signatures of individual polluting compounds, which are sometimes present in concentrations as low as a few hundred parts per billion.

The impact of Dr. Sherwood Lollar's research has been profound both nationally and internationally. Cleaning up ground water contaminants such as hydrocarbons and chlorinated solvents represents one of the most urgent challenges facing society.

In 1998, she was selected as the Henry Darcy Distinguished Lecturer by the U.S.-based Association of Ground Water Scientists and Engineers. Each year, the professional association selects one of its most distinguished scientists to deliver a series of lectures highlighting a sophisticated new scientific approach to major geochemical and hydrogeologic problems. The lectureship involves 30 lectures at major research centres and universities throughout the world.

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Continued from page 5

Dr. Norman C. Beaulieu
Queen's University
Mathematical approaches to wireless communications

A world authority in wireless communications theory, Dr. Norman Beaulieu has discovered ingenious mathematical approaches to predict how well new wireless and digital communications systems will perform. His methods are of keen interest to, for example, cell phone network designers who need to know whether phenomena such as channel fading and data loss will affect users.

Dr. Beaulieu's mathematical improvements to the process of predicting accurate and reliable performance in such areas could mean that communications companies may be able to dramatically reduce their spending on expensive software simulation.

In addition to his duties as a full professor at Queen's University, Dr. Beaulieu edits the leading international journal in his field and holds a cross-appointment as Professor of Mathematics and Statistics. In January, he was elected Fellow of the Institute of Electrical and Electronics Engineers.

1999 Doctoral Prize Recipients

Dr. Hong Yang
University of Toronto
Natural Sciences

For many years scientists have been seeking ways to design and shape "supra molecules" of inorganic materials with the same ease with which plastics, pharmaceuticals and countless other large organic molecules have been built from smaller blocks. Dr. Hong Yang's pioneering thesis has paved the way to designer structures—fibres, films and a variety of shapes and patterns—made of silica. Potential applications for these materials include building components for novel composites and nanoscale devices, aids for controlled delivery of drugs, and replacements for bone and other biological structures.

Dr. Troy Day
Queen's University
Natural Sciences

Dr. Troy Day uses game theory, genetics and dynamic optimization to gain new perspectives on some profound issues in evolutionary biology. His rigorous mathematical approach provides theoretical insight into a variety of topics. These include improving understanding of how a plant allocates resources to growth or reproduction when it competes with related neighbours; the evolution of different types of altruism among related individuals such as social bumblebees; and the influences that govern the increasing frequency of Down syndrome births in older women.

Dr. Edward Sargent
University of Toronto
Engineering

Dr. Edward Sargent's work has shed light for the very first time on the essential physical mechanisms that underlie the operation of the lateral current injection laser. His groundbreaking research has proved that it is possible to build and interconnect these laser devices using standard semiconductor fabrication techniques. This work has opened an avenue for making laser light the driving force of future microchips. Dr. Sargent designed, built and tested promising versions of these novel microlasers, then initiated and managed collaborations with researchers at Nortel Networks, Bell Communications Research, Corning and the University of Michigan at Ann Arbor. Dr. Sargent holds the Nortel Junior Chair in Emerging Technologies at the University of Toronto.

Dr. Hoan Huu Pham
University of Waterloo
Engineering

The functioning of many electronic microsystems, including ultra large-scale integrated circuits, sensor arrays and microelectromechanical systems depends on how the various parts and components in the system interact electrostatically. Dr. Hoan Huu Pham has produced an engineering tool that provides an accurate and complete analysis in three dimensions of the charge and potential behaviour of structures that are large and complex or arbitrarily shaped. Beyond being important for the design of large-area electronics and imaging arrays, his techniques can be applied to simulate particle systems in areas of science as diverse as astrophysics, plasma physics and the study of molecular dynamics.

Update on the 1998 Strategic Project Grants Competition

An additional 16 Strategic Project grants have been awarded in the 1998 competition.

In September, the Strategic Projects panels identified more proposals that should be funded than the budget was able to support (see Winter 1998 issue of *Contact*). A reallocation of funds within the Research Partnerships Program budget in February allowed an additional 16 proposals to be funded.

With these additional awards, 89 new proposals will be funded in 1998-99, totalling $25,397,333 in year one. This increases the success rate for the competition to 36.2 per cent.

Notice anything new?

Contact isn't what it used to be—we've changed colours, our "visual identifier" (that is, our logo) and our layout (now three-column, more boxed text)—all to make it easier to read.

Contact's new look is part of our revitalized corporate identity. All NSERC's corporate communications, from Web site to publications, will feature this fresh new take on our traditional image.

Our new logo combines a white maple leaf with a bold, oblique typeface that conveys in our new wordmark the strong and dynamic name by which we wish to be known: "NSERC." (See "Just call us "En'serk," below for an explanation of why we've decided to concentrate on our acronym, rather than our full name, from now on.)

The new logo preserves the original logo's design elements, while adding new dimensions to reflect NSERC's evolution. The maple leaf itself will identify NSERC as an organization for all Canadians. The three distinctive pinnacles within the leaf tie into our three key themes:

- our three main partners—university, industry and government;
- the three themes in our slogan—"investing in people, discovery and innovation"; and
- our three program areas—Research Grants, Scholarships and Fellowships, and Research Partnerships.

Now, if we can just get them to pronounce our name right...

NSERC
CRSNG

The new *Contact*—less will be more

Contact has gone on a diet. Now that the majority of our program news—much of it time-sensitive—appears on our Web site (www.nserc.ca), *Contact* will have a tighter focus. Look for:

- A message from the President;
- Program news designed to direct people to the appropriate Web page; and
- One or two feature articles or thought pieces (for which we encourage readers to suggest topics they consider of interest to the community as a whole).

Just call us "En'serk"—spelled "NSERC"—

Even other federal departments have been known to get the English version of our name wrong. Here are a few of the more common misnomers. After 20 years of mix-ups, we've decided it's time to go with the short form whenever we appear in public.

You know—don't you?—which of the following formal titles "NSERC" really stands for:

- ❑ National Science and Environment Committee
- ❑ National Science and Engineering Committee
- ❑ National Research Council
- ❑ National Science and Environment Council
- ❑ Natural Sciences and Engineering Research Council
- ❑ National Sciences and Engineering Research Council (cited in the proceedings from the first meeting of the NSERC Council)
- ❑ Northern Science and Engineering Council (in a letter from another federal department)
- ❑ Natural Sources and Engineering Research Council (sign in a local hotel, guiding participants to an NSERC function)
- ❑ National Science and Engineering Research Council
- ❑ National Scientific and Engineering Research Council

Order of Canada recognizes two outstanding researchers

Dr. Howard Alper

Dr. Ralph Haas

Dr. Howard Alper and Dr. Ralph Haas, both well known to the NSERC community, have been appointed to the Order of Canada, as announced last October by the Governor General of Canada, Roméo LeBlanc.

Dr. Howard Alper

Dr. Alper, named an Officer of the Order of Canada, has made many outstanding contributions to Canadian science. Currently Vice Rector, Research, at the University of Ottawa, Dr. Alper has made numerous scientific discoveries, related to polyesters, fibres, foams and pharmaceuticals. These discoveries have led to significant economic growth in numerous sectors of our society. In addition, he was also instrumental in the development of the Partnership Group for Science and Engineering (PAGSE), whose member societies address issues concerning research and applications of science in Canada and define their economic benefits. A true leader in the broadest sense, Dr. Alper has encouraged important reflection upon the future of science and engineering.

Dr. Ralph Haas

Dr. Haas, named a Member of the Order of Canada, is widely known for his work as an educator, researcher and professional engineer in the field of civil engineering at the University of Waterloo. He pioneered the systems concept and development of engineering technology for managing networks of paved roads. His concept is now used by municipal, provincial, state and federal government transportation agencies in North America and abroad. The author of 10 books and over 300 technical papers, Dr. Haas has also lectured and consulted in several countries. His innovations have resulted in many management and economic benefits for public transportation agencies in Canada and overseas.

"Global Payments" Initiative To Be Implemented on April 1, 1999

On April 1, 1999, NSERC and SSHRC will be implementing a new mechanism for the payment and administration of their scholarships and fellowships that are held at Canadian universities. Instead of receiving instalment payments directly from the Councils, NSERC postgraduate scholarship (PGS) holders will be paid through their university, which in turn will be reimbursed by the Councils. The university will also be responsible for managing these awards in accordance with the regulations set by the Councils. This initiative is marked by close partnerships among the Councils, Canadian universities and our award holders and is intended to provide award holders at Canadian universities with an efficient and easily accessible service in the administration of their awards.

New PGS awards offered in the 1999 competition will be the first ones that will be administered and paid entirely under the new system. However, current PGS holders who have at least one full year of funding remaining will also receive payment of the balance of their award through their university beginning on the first anniversary of the original start date of their award.

Awards Search Engine Launched

Thanks to our new Web search engine, you can easily obtain information on the research NSERC supports in Canadian universities.

Visit our Web site (**www.nserc.ca/programs/result/database.htm**) and find out "how to use the search engine effectively," by clicking on those words at the bottom of the search engine page.